Changes in Hot and Dry Extremes Based on Convection-Permitting Projections Under the SSP5-8.5 Scenario

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Accelerated global warming is expected to increase the severity and frequency of concurrent extremes, which can have negative impacts that often extend beyond those of a single event. Southeastern China has witnessed an increased occurrence of concurrent hot and dry extremes in recent decades, and the anticipated amplification of such events is likely to aggravate economic damages and endanger human welfare. Although the significant impacts of these concurrent extremes have spurred strong demand for reliable future projections at local levels, most studies have primarily focused on univariate analysis of single extremes using coarse-grid global climate model (GCM) projections. Such an approach could potentially overlook the region-specific climate impacts of global warming. In this regard, the present study will integrate convection-permitting (CP) regional climate modeling and multivariate statistical analysis to assess the future changes in concurrent hot and dry extremes. The Weather Research and Forecasting (WRF) model will be used to downscale the bias-corrected CMIP6 GCM projections under the SSP5-8.5 scenario at the CP scales (4 km) over southeastern China. The focus is given to investigating the process-based added value of CP projections when assessing future changes in concurrent hot and dry extremes over the densely populated China regions. The high-resolution simulation is expected to greatly advance the understanding of compound climate extremes and provide quantified insights about prospective climate risks in China.

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